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ABSTRACT

An attempt was made to investigate the hypothesis that deaf pre-college students could learn English more effectively by using a curriculum described in mathematical terms and notations where possible. An evaluation of materials based on structural linguistics was made; 56 subjects in the experimental group who used the first version of the curriculum were compared to 56 students in a control group. It was found that while the materials could be learned, there was little transfer to reading or writing. The logic of transformational generative grammar was also used with 174 students. It was not possible, however, to demonstrate experimentally the added value of the transformational generative grammar curriculum. (KN)

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AN ANALYTIC CURRICULUM IN ENGLISH FOR DEAF STUDENTS AT THE SECONDARY LEVEL

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Gallaudet College
Washington, D. C. 20002

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SUMMARY

The Gallaudet College English Curriculum Center was established to produce and evaluate curriculum materials which could be used to remedy the English language difficulties of pre-college deaf students. It was hypothesized that curriculum materials developed from modern linguistic descriptions of language and described in mathematical terms and notation where possible would be a more effective learning vehicle for deaf students. Similarly, it was thought that cognitive measures of English fluency would offer additional predictive power over the conventional predictors of English ability.

Curriculum analysis and revision occupied Center personnel for more than four years. The first set of materials produced was based on structural linguistics. While this logic could be learned by the students, there seemed to be little transfer to their reading and writing ability. Consequently, the logic of transformational generative grammar became the primary descriptive tool. This logic was followed in both the next-to-last and last version of the curriculum materials produced in 1966 and 1967 respectively. The analysis reported herein is concerned mainly with the evaluation of these last two versions of the curriculum materials.

The next-to-last version of the materials was used in experimental classes which contained 56 students at the close of the 1966-67 academic year. A control group (N = 53) studied conventional English materials. Sections were matched on English ability. A factorial analysis of gain scores on eight dependent variables was conducted. The dependent variables were vocabulary, knowledge of rules of composition, level of reading comprehension, speed of reading comprehension, and unstructured essay writing performance. Both experimental and control groups showed improvement on the global measures of English ability. Although only a few statistically significant differences between experimental and control group performance were observed, the experimental group did better than the control group on seven of the eight dependent variables. These results were regarded as sufficiently promising to attempt a final revision.

In the final year of analysis, all students (N = 174) studied the last version of the curriculum materials. Their performance was disappointing. The differences between initial and final performance on three global measures of English proficiency and on three grammatical chacteristics of unstructured essay writing were in both directions, statistically significant, but very small. It was not possible, therefore to demonstrate experimentally the added value of the curriculum materials.

Thirteen measures of English fluency were tested as potential predictors of English performance. Multiple regression analyses indicated that none of these tests offered sufficient reliable additions to the predictive power of the existing battery of tests to warrant operational usage.

The curriculum materials appended to this report are the last version of the curriculum materials produced by the curriculum center.

INTRODUCTION

This is the final report of the activities of the Gallaudet College English Curriculum Center which began operation in August 1964. The report will be concerned primarily with an evaluation of the effectiveness of the next-to-last and the last versions of these materials. Finally, it will furnish a description of the actual curriculum materials.

Essentially, curriculum preparation and evaluation took place over a three year period. A different phase of work was emphasized each year. During the first year, project personnel explored the latest linguistic descriptions of the English language. They also familiarized themselves with contemporary secondary mathematics by taking formal instruction from the Chairman of the Department of Mathematics. With this knowledge, they attempted to cast or describe the operations of certain grammatical systems of the English language operations in mathematical form. While it proved relatively easy to describe some language operations in mathematical terms, on the whole the results of this activity were somewhat disappointing. Comparatively little was added to that which had already been developed for The Calculus of Structure.[1]

In the second year, project personnel greatly enlarged the output of curriculum materials for classroom tryout. The primary linguistic model employed was that of structural linguistics. Since English has a coherence and a structure, materials had to be organized parallel to this structure and prepared in quantity long before introduction into the classroom. It became apparent during the course of this second year that both the basic rationale of structural linguistics and the mathematical notation used could be learned by the students. But this learning was limited. The students seemed able to analyze and classify the structure of existing sentences but unable to transfer this learning to the creation or generation of sentences in a prose passage. Consequently, late in the second year transformational-generative grammar, which consists basically of a set of rules to generate sentences, appeared to be an alternate approach which might facilitate this transfer. It was too late in the year, however, to revise materials for use in an on-going program of instruction. Hence, difficulties in existing materials were noted for revision. Revisions and structural changes in the organization of the materials were reserved for the summer.

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[1] Stokoe, W. C., Jr., The Calculus of Structure, a manual for college students of English, Wash., D. C. 1960

The problem of evaluating and revising English curriculum materials while in actual classroom use is a particularly thorny one and worth discussion here. With very young children and with relatively unstructured or repetitive subject matter it should be fairly simple to introduce new materials into the classroom, check on how well these materials are learned, and revise them somewhat for another classroom trial a day or so later. When dealing with nineteen year olds in a one year remedial program, the classroom teacher and the student are oriented to the furthering of their own interests and solving of their own problems. Project personnel were convinced that the re-introduction of somewhat modified materials would have a deleterious effect on student motivation. Furthermore, subject matter coverage was a requisite in this program. There simply was not enough time to return to the same points several times and still complete instruction on all the language problems these students faced. In short, an operational classroom does not permit the kind of "tinkering" that might be carried out in a laboratory.

Consequently, the principal devices used to assess or evaluate instructional materials were chapter pre- and post-test scores and teacher judgments. Essentially, all of the elements in the material to be covered in the chapter were tested before instruction began. When the chapter was finished, usually after a period of several weeks, a post-test was taken by the students. This permitted a topic assessment to be made. (See Appendix for a listing of topics which are included on the achievement record forms for the final materials.) Teacher judgments were recorded routinely and separately for later consideration. This turned out to be a very workable arrangement but revised materials could not be tried again for another year.

The summer of the third year was devoted to the radical revision of curriculum materials following the logic of transformational-generative grammar where appropriate. Many elements of structural linguistics, as well as semantic explanations, were retained. The remainder of this third year was taken up with the experimental tryout of the materials for the academic year and the statistical evaluation of their effectiveness.

It was intended that this would suffice as far as curriculum production was concerned, but the on-going process of evaluating the materials in classroom use convinced project personnel that a very considerable improvement could yet be made in the materials. Hence, the last half of the third year was devoted to still another total revision of the materials. The exposition was rewritten. Exercises were increased in number and were better integrated with the exposition. All tests were revised. In effect an entirely new product was created. This last version of the materials impressed the personnel as so much improved that they used it in the classroom after the scheduled termination of the project. It was decided, therefore, to devote a fourth year to the tryout and evaluation of this final version even though a control group design could not be used. No additional funds were needed to carry out this evaluation. This final report, therefore, includes an evaluation of both the next-to-last and last version of the materials. A clear distinction will always be made between these two versions.

METHODS

A. Sample

Admission standards for the Gallaudet College preparatory program have remained substantially the same over the four year span of the curriculum effort. Applicants must submit medical evidence of a better-ear hearing loss on the order of 60 db or greater. About half of those who apply are accepted, but about 85% of these are enrolled in a one year preparatory program which is basically remedial in character. Preparatory students study general science, algebra, geometry and English. The basic objective of the English curriculum is the improvement of the writing and reading skills of the student.

The next-to-last version of the materials was used in the 1966-67 academic year at which time there were 232 preparatory students who came from almost every state. The mean age of the group was about 19.5 years. The mean of their Inglis Vocabulary scores was 38.53 with an S.D. of 11.88, and they averaged 134.34 on the Cooperative Reading Test with and S.D. of 7.02. These statistics indicate that these students perform in the lowest quartile of high school seniors as far as their English language proficiency is concerned.

The last version of the materials was employed in the classrooms in the 1967-68 academic year. The 174 preparatory students had essentially the same characteristics and English language proficiency as the earlier group.

B. Material Preparation and Description

Although describing the operations of the English language in mathematical terms or forms is inherently a creative act, attempts were made both to enhance the ability of project personnel to carry out these acts and to systematize the effort once it was underway. First, all of the project personnel took a course with the chairman of the mathematics department in secondary level contemporary mathematics. This course was comparable to that taken by the preparatory students. Subsequently, the mathematical texts used in the preparatory mathematics program, essentially contemporary algebra and geometry, were indexed by vocabulary employed, symbols utilized, and operations outlined or described. These indexes formed the basis of lists which were examined independently by each member of the project team to determine if a parallel operation or process existed in English. Team members were permitted to consult other English and mathematics texts. In addition to these individual efforts, teams of project personnel were assigned the same task in the hope that the interaction might enhance creativity. Unfortunately, results were rather meager. While it was often possible to find illustrations comparable to a given mathematical operation, these illustrations usually had limited usage in English and hence little explanatory power. Nevertheless, a few mathematical concepts proved useful and were incorporated into the curriculum material. As will be noted below, most of the notation and symbolic logic employed

in the curriculum materials came from that which had already been developed for transformational grammar and structural linguistics.

Because the same goals and format were used for both the next-to-last and last version of the curriculum materials, a single description will suffice.

Material for a year's work is divided into ten chapters. The first six chapters deal with simple sentence structure while Chapter Seven deals with compound sentences and simultaneously serves as a review of simple sentence patterns. The second part of the work, Chapters Eight through Ten, covers complex sentence structure and subordination.

Each chapter follows this general pattern: The first element is a pre-test which is administered to the student before any instruction. The pre-test covers all the grammatical material to be taught in the chapter. The pre-test serves two purposes (a) it can be used as a diagnostic tool by the teacher and (2) it permits the assessment of student achievement by serving as a standard against which a post-test score can be compared.

The second major element in the chapter is the exposition on that aspect of language to be covered in the chapter. Transformational grammar is the principal tool used in the exposition to describe the English language. It is not intended that wrting such grammar be learned as an end in itself, but familiarity with the process is a tool for the student. Where better descriptions of language than transformational grammer are available, these are used also. In short, an eclectic approach is followed. Some exercises are a generic and illustrative part of the exposition. Additionally, the exposition is extensively cross-referenced to all of the other materials in the chapter.

The third major part of a chapter consists of a set of highly structured exercises covering all of the points and topics in the chapter. These exercises are very numerous so that the teacher can select from among them. Exercises have been varied deliberately to maintain student interest. Some of the exercises resemble the pre-test questions, some grow out of the exposition, and others present a variety of kinds of language manipulation. As a rule the student is directed to write or manipulate the language. In some cases, he identifies language elements.

The fourth major aspect of each chapter consists of a series of writing exercises. The paragraph is the usual writing unit. The directions for writing the paragraphs are structured so that the resulting paragraphs will contain a high proportion of the kind of sentence structure and elements covered in the other sections of the chapter. Sentence parts and structure are related to one or more principles of rhetoric wherever possible.

The final element in the chapter is the post-test. The content exactly parallels the content of the pre-test even to the identical number of items. In the next-to-last version the number of items varies from chapter to chapter. In the last version, the number of credits, not necessarily equal to the number of items, is set at 100 for every chapter. An achievement record for each chapter is supplied for each student. On this record is a description of the contents of the chapter test, a place for the scores on each part of the pre- and post-tests, and space for any other information the teacher may want to record about a student. (A complete set of the achievement records for the last version of the curriculum materials is included in the Appendix.) It is suggested that these achievement records be viewed as a rough outline of the topics covered in the curriculum materials. However, the amount of exercise material and the thoroughness of the exposition is only roughly related to the credits allotted each topic in the achievement record.

As indicated in the introduction, the last version of the curriculum materials differs from the next-to-last version in that transformational-generative grammar is the basic logic around which the curriculum materials are organized. Of course, the last version is also a much improved revision of text, exercises, and tests developed in the earlier manual.

C. Basic Design

The three major aspects of this study are (1) the classroom tryout of curriculum materials, (2) the evaluation of the effectiveness of the total curriculum on the English performance of students and (3) an exploration of some measures of English fluency as potential predictors of English performance.

(1) Classroom Tryout of Curriculum Materials:

As indicated earlier, the students for whom these curriculum materials were preparedhave a mean age of 19.6 and had hoped to enter college. However. because of their scores on the entrance examinations it was necessary for them to undertake a remedial program designed to improve their language skills in a single year's time. Materials introduced into such a classroom surely must be used and evaluated in a way deemed fitting by both teacher and students. It was not considered feasible to present materials on a given language topic, modifythe materials on the basis of classroom performance, and reintroduce the modified materials into the same classroom a day or two later because the motivation of the students would suffer badly. Moreover, such a curriculum has a structure which must be maintained from day to day.

It was decided, therefore, that rather than make revisions as quickly as possible, procedures would be developed to record fully the difficulties or deficiencies found in the materials. A central log of all materials was the first device used. All teachers entered detailed comments and criticisms of the materials on a daily basis. The second method of evaluating materials came out of the utilization of chapter pre- and post-tests. These tests offer very comprehensive coverage of the topics to be taught the student. Examination of the differences in achievement from pre- to post-test by specific topic highlighted the need for revision of materials. A cross comparison with the log entries often provided clues for a specific kind of revision.

(2) Overall Effectiveness of Curriculum Materials:

The basic experimental design for the next-to-last version of the materials centers in a comparison of the gains achieved by students taking the new English curriculum materials with those who study more traditional or conventional materials. And since curriculum materials may vary in effectiveness with the level of English ability of the student, this was treated as an added factor in the experiment. For convenience, the students were grouped into three levels of English ability; high, middle and low. In short, a two by three factorial analysis of gain scores was used to analyze the data. A variety of gain scores served as the criteria or dependent variables. These included measures of reading level of comprehension, speed of comprehension, vocabulary knowledge, and several aspects of writing ability.

The decision to evaluate statistically the last version of the curriculum materials was made after the 1967-68 academic year had already begun. Consequently, it was only possible to use a simple pre- and post-treatment design for the entire group. Levels of English ability were dropped and fewer dependent variables were measured.

(3) Measures of English Fluency as Potential Predictors of English Performance:

The primary source for additional predictors of English performance was the Kit of Reference Tests for Cognitive Factors.[2] These tests were assembled because they had heavy loadings on a wide variety of orthogonal factors. Four fluency factors and one associational factor seemed worth exploring. The kit offered 13 tests designed to measure these five factors. Evaluation of these potential predictor tests required that they be administered to all preparatory

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[2] French, J.W., Ekstrom, R.B., and Price, L.A., Manual for Kit of Reference Tests for Cognitive Factors, Educational Testing Service Princeton, N. J., June 1963

students during one year of study with the object of obtaining and testing zero order correlations against an achievement test criterion for statistical significance. Those tests with statistically significant levels of prediction were subsequently included in a predictor battery the following academic year (1966-67). This predictor battery had as its two principal elements the Gallaudet Composition Examination and the Inglis Vocabulary Test. The goal of this analysis was to determine if any of the new tests added to the multiple regression prediction of several criteria of English performance already achieved by the Gallaudet Composition Examination and the Inglis Vocabulary Test.

D. Variables

(1) Classroom Tryout of Curriculum Materials:

Each of ten chapters of the curriculum materials has pre- and post-tests covering all topics taught. Separate scores were obtained for each topic in the chapter. Since these tests were designed for diagnostic rather than evaluative purposes, difficulty levels of the questions vary widely. A great many questions were deliberately made easy so that discriminations could be made among the weakest students.

(2) Evaluation of the Effectiveness of Next-to-Last Curriculum.

The first factor to be studied was the level of English ability of the student. The index of English ability used was the sum of the raw scores on Part 1 of the Gallaudet Composition Examination and on the Inglis Vocabulary Test.

One of several alternate forms of the Gallaudet Composition Examination is administered annually to all incoming students. Part 1, the most diagnostic part of the tests, is made up of 35 multiple-choice items on English language usage. The aspects of English usage tested are those with which deaf students have more than the normal amount of difficulty. The Inglis Vocabulary Test is a simple multiple choice vocabulary test of 100 items. On the basis of the sum of scores on these two tests, students were assigned to homogeneous classes of about a dozen each. These classes were in turn organized into high, middle and low levels for statistical analysis. The means and S.D.'s for the 1966-67 students on the Gallaudet Composision Examination and Inglis Vocabulary Tests are given in Tables 2 and 5 respectively.

The second factor or independent variable studied was the kind of curriculum materials used in instruction. The experimental group studied the

next-to-last version of the new curriculum while the control group used more conventional materials. Classes were randomly assigned to experimental and control groups. Four teachers worked with the experimental group and three taught the control group. Teachers who taught students having the same ability level had roughly the same amount of teaching experience. A one week orientation was given to those teachers who used the experimental materials. Teachers responsible for the control group organized their instruction around conventional grammar books and works of literature normally found in secondary level curriculums. The number of days per week spent on structured study of grammar for both the experimental and control classes varied from about three days for students of the lowest level of English ability to about one for the most able classes.

Performance was measured on nine dependent variables. Each variable consisted of gain scores or the difference between the scores obtained at the beginning and end of the academic year. The variables are: The Gallaudet Composition Examination and the Inglis Vocabulary Test, both of which have been described above and which were the first measure of English performance, and instructor ratings of essay quality. Students were given one hour to write an essay describing the social or athletic event that they enjoyed most the previous year. Fall essays averaged 370 words with an S.D. of 118. Spring essays averaged 271 words with an S.D. of 102. Students clearly wrote less at the end of the year. All essays were typed, given randomly assigned code numbers, and presented in that form to four instructors for evaluation. The instructors were told to rate the essays on a quality scale ranging from one to five on the basis of a single quick reading. They were given two representative samples for each rating level. The final essay quality score was the sum of all four ratings.

While ratings of overall quality are clearly the most important measure of writing skill, more specific and objective characteristics of the same essays were also measured. These were: percentage of nouns and articles used correctly in the first 100 words, and percentage of subject-verb agreement for the main clauses of all the sentences.

Since one can make fewer errors merely by writing more simply (using fewer transforms) a measure of the complexity of the language used in the essay was desired. A form was developed which could be used as a guide to measure or count the complexity of the generative grammar of the sentences. Complexity covered the number of transforms used by the writer, the number of transform rules that were used correctly, and the number of rules misused. A copy of the coding sheet which lists the transform rules appears on page( ) in the Appendix.

A discussion of the variables involved in the evaluation of the last version of the curriculum materials will be found in the appropriate RESULTS section below.

(3) Potential Fluency Predictions of English Performance:

All of the potential predictors can be characterized as brief speed tests requiring that the student write as many words or phrases in a given pattern as he is able to in a few minutes. The five factors explored were:

Fa: Associational Fluency. "The ability to produce words from a restricted area of meaning."

Fe: Expressional Fluency: "The ability to think rapidly of appropriate wording for ideas.

Fi: Ideational Fluency: "The ability to call up ideas wherein quantity and not quality of ideas is emphasized."

Fw: Word Fluency: "Facility in producing isolated words that contain one or more structural, essentially phonetic, restrictions, without reference to the meaning of the words.

Xs: Semantic Spontaneous Flexibility" "The ability to produce a diversity of verbally expressed ideas in a situation that is relatively unrestricted."

RESULTS

A. Classroom Tryout

As stated earlier the dataobtained from the chapter testing were intended for diagnostic purposes. Summary statistics such as the means and S.D.'s of the pre- and post-tests and gains were used as guides for revision. Since diagnosis was the sole purpose for the data, these summary statistics will not be presented here.

B. Evaluation of the Overall Effectiveness of Curriculum Materials (Next-to-Last Version, 1966-67)

At the beginning of the school year 147 students were enrolled in the classes participating in the study. Of these, 76 were in the seven experimental sections and 71 were enrolled in the matching control sections. School drop outs for all reasons numbered 17 in the experimental classes and 15 in the control classes. The question which immediately arises is whether the two groups remained approximately equal in ability. To answer this question, means and S.D.'s on four measures of English ability for those students who did not finish the school

year were obtained and are presented in Table 1. The measures of ability are the Gallaudet Composition Examination, the Inglis Vocabulary Test, the Cooperative Reading Test Level of Comprehension and Speed of Comprehension. The comparisons between experimental and control means on all four measures of ability revealed statistically insignificant differences. It can be concluded, therefore, that the ability levels of the two groups remained essentially the same and that comparison between the remaining students in the experimental and control group will be unbiased.

Table 1

Means and Standard Deviations of Four Measures of English Ability of Students Who Did NOT Complete the Preparatory Year
(Experimental N = 17. Control N = 15)

	Gallaudet Comp. Examination		Inglis Vocabulary Test		Coop. Reading Level of Comprehension		Coop. Reading Speed of Comprehension	
	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
Mean	18.8	20.0	40.8	46.8	137.1	138.8	140.7	142.3
S.D.	7.9	6.8	11.0	15.64	7.4	7.3	6.1	7.6
	t = .44		t = 1.18		t = .62		t = .59	

As an aside, an inspection of the means presented in Table 1 with the comparable fall session statistics of those students who finished the year, (Tables 2, 5, 22, and 25) shows that students who left college before the year ended were not very much below the average level of ability of those who remained.

The first table on each of the following pages of tables presents summary statistical descriptions of ability on performance at the opening and close of the academic year for both experimental and control groups. The second table on each page includes only the difference or gain scores. The final table on each page is the summary of analysis of variance. (The complexity of structure measure received a somewhat different analysis and will be described below.)

Table 2

Means and Standard Deviations of Part I of Gallaudet Composition Examination at Open and Close of Academic Year 1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S.D.	M	S.D.
High	14	23.00	3.80	22.92	3.68	16	22.43	3.59	23.37	5.28
Middle	25	19.04	4.44	20.16	3.49	20	19.15	4.22	19.55	3.56
Low	19	14.84	3.81	18.15	3.12	18	15.22	2.39	17.94	4.02
Total	58	18.62	5.07	20.17	4.01	54	18.81	4.50	20.14	4.75

Table 3

Means and Standard Deviations of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	-.07	1.63	.93	3.90
Middle	1.12	3.55	.40	2.56
Low	3.31	3.12	2.72	3.73
Total	1.55	3.28	1.33	3.49

Table 4

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H, M, L)	144.17	2	72.08	6.72*
Methods (E & C)	.36	1	.36	.03
Interaction	16.91	2	8.46	.81
Within Cells	1104.85	106	10.42	
Total	1266.29	111		

* $P < .01$

Table 5

Means and Standard Deviations of Inglis Vocabulary Raw Scores at Open and Close of Academic Year 1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S.D.	M	S.D.
High	14	46.78	13.48	56.50	13.48	16	52.75	12.65	58.37	9.27
Middle	25	33.32	8.88	47.24	7.85	19	36.94	6.27	44.26	13.60
Low	17	32.23	7.40	35.82	6.93	18	34.38	9.52	36.61	8.46
Total	56	36.35	11.42	46.08	11.82	53	40.84	12.37	45.92	13.82

Table 6

Means and Standard Deviations of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	9.71	14.89	5.62	10.03
Middle	13.92	11.62	7.31	11.98
Low	3.58	9.31	2.22	6.71
Total	9.73	12.50	5.07	9.91

Table 7

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H, M, L)	1113.55	2	556.78	4.65*
Methods (E & C)	401.63	1	401.63	3.36
Interaction	101.78	2	50.89	.42
Within Cells	12321.29	103	119.62	
Total	13938.25	108		

* $.01 < P < .05$

Table 8

Means and Standard Deviations of Level of Comprehension on Cooperative Reading Test at Open and Close of Academic Year 1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S.D.	M	S.D.
High	12	139.66	8.16	145.33	8.16	18	140.61	9.31	143.66	9.35
Middle	23	133.39	4.84	136.47	6.50	20	132.80	4.67	134.90	6.17
Low	19	130.57	4.78	135.10	6.74	18	131.44	4.20	133.66	5.82
Total	54	133.79	6.55	137.96	7.90	56	134.87	7.48	137.32	8.38

Table 9

Means and Standard Deviations of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	5.66	7.72	3.05	4.47
Middle	3.08	6.21	2.10	7.66
Low	4.52	8.37	2.22	7.19
Total	4.16	7.30	2.44	6.53

Table 10

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H, M, L)	52.24	2	26.12	.53
Methods (E & C)	98.84	1	98.84	2.02
Interaction	8.83	2	4.42	.09
Within Cells	5100.45	104	49.04	
Total	5260.36	109		

Table 11

Means and Standard Deviations of Speed of Comprehension on Cooperative Reading Test at Open and Close of Academic Year 1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S.D.	M	S.D.
High	12	138.83	4.93	144.66	4.73	18	144.44	8.17	144.66	7.82
Middle	23	136.08	4.28	139.17	4.18	20	137.45	3.57	138.25	4.67
Low	19	133.21	3.93	137.26	4.09	18	133.55	3.68	135.77	5.55
Total	54	135.68	4.73	139.72	5.04	56	138.44	7.01	139.51	7.06

Table 12

Means and Standard Deviations of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	5.83	5.55	.22	3.11
Middle	3.08	5.00	.80	3.66
Low	4.05	5.48	2.22	6.27
Total	4.03	5.30	1.07	4.52

Table 13

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H.M.L)	31.24	2	15.62	.65
Methods (E & C)	282.40	1	282.40	11.71*
Interaction	73.07	2	36.54	1.51
Within Cells	2508.77	104	24.12	
Total	2895.48	109		

* $P < .01$

Table 14

Means and Standard Deviations of Instructor Ratings of Essay Quality
at Open and Close of Academic Year
1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S.D.	M	S.D.
High	14	9.71	2.64	11.28	3.24	18	10.66	2.54	11.33	3.69
Middle	25	8.04	2.31	8.60	2.46	19	8.94	2.29	8.68	3.00
Low	20	7.25	2.17	7.25	1.88	18	6.38	1.94	6.77	2.07
Total	59	8.16	2.49	8.77	2.89	55	8.67	2.84	8.92	3.48

Table 15

Means and Standard Deviations
of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	1.57	2.82	.66	2.74
Middle	.56	2.51	-.26	2.94
Low	.00	1.94	.38	1.41
Total	.61	2.44	.25	2.45

Table 16

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H, M, L)	21.97	2	10.98	1.84
Methods (E & C)	5.54	1	5.54	.93
Interaction	9.60	2	4.80	.80
Within Cells	645.55	108	5.98	
Total	682.66	113		

Table 17

Means and Standard Deviations of Percentage of Nouns Used Correctly in Essays at Open and Close of Academic Year 1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S. D.	M	S.D.
High	14	92.85	6.73	92.56	5.57	18	87.82	7.49	89.58	7.65
Middle	25	88.62	6.42	89.41	7.61	19	90.18	6.29	87.55	8.60
Low	20	87.09	7.47	84.32	10.84	18	86.47	7.56	89.81	7.79
Total	59	89.11	7.10	88.43	8.93	55	88.19	7.16	88.96	7.95

Table18

Means and Standard Deviations of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	-.29	5.10	1.75	7.53
Middle	.78	6.32	-2.62	10.30
Low	-2.76	8.82	3.33	9.18
Total	-.67	7.09	.76	9.29

Table 19

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H, M, L)	54.13	2	27.06	.42
Methods (E & C)	69.17	1	69.17	1.05
Interaction	421.21	2	210.49	3.21*
Within Cells	7090.24	108	65.65	
Total	7634.75	113		

* $.01 < P < .05$

Table 20

Means and Standard Deviations of Percentage of Articles Used Correctly in Essays at Open and Close of Academic Year 1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S.D.	M	S.D.
High	14	87.19	8.19	86.30	5.53	18	82.06	13.27	85.40	10.27
Middle	25	81.87	9.99	84.69	8.18	19	84.43	6.79	77.38	13.35
Low	20	79.94	8.19	78.64	6.92	18	80.13	8.78	79.02	11.61
Total	59	82.47	9.27	83.02	7.79	55	82.25	9.91	80.54	12.13

Table 21

Means and Standard Deviations of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	-.89	7.14	3.33	14.12
Middle	2.82	8.53	-7.05	15.39
Low	-1.30	7.94	-1.11	11.53
Total	.54	8.13	-1.70	14.22

Table 22

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H, M, L)	220.92	2	110.46	.88
Methods (E & C)	92.34	1	92.34	.74
Interaction	978.42	2	489.21	3.90*
Within Cells	13,534.58	108	125.32	
Total	14,826.26	113		

* $.01 < P < .05$

Table 23

Means and Standard Deviations of Percentage of S-V Agreement in Essays at Open and Close of Academic Year 1966-67

	Experimental Group					Control Group				
		Fall		Spring			Fall		Spring	
	N	M	S.D.	M	S.D.	N	M	S.D.	M	S.D.
High	14	80.47	22.21	82.68	14.70	18	79.48	21.14	75.11	16.85
Middle	25	68.08	17.78	79.05	17.60	19	78.10	14.75	77.78	20.26
Low	20	79.60	16.00	70.37	16.22	18	79.97	17.99	67.42	13.82
Total	59	78.48	29.24	76.97	16.95	55	79.16	17.77	73.51	17.49

Table 24

Means and Standard Deviations of Difference Scores

	Experimental Group		Control Group	
	M	S.D.	M	S.D.
High	2.21	26.70	-4.37	20.50
Middle	10.96	19.24	-.32	21.08
Low	-9.22	19.14	-12.54	21.74
Total	2.04	22.61	-5.64	21.34

Table 25

Summary of Analysis of Variance

Source of Variation	SS	df	MS	F
Levels (H, M, L)	4,947.67	2	2,473.84	5.53*
Methods (E & C)	1,389.23	1	1,389.23	3.10
Interaction	297.46	2	148.73	.33
Within Cells	48,312.60	108	447.34	
Total	54,946.96	113		

* $P < .01$

Inspection of the difference tables reveals that improvement was demonstrated by both experimental and control groups on the global ability measures, i.e., the rating of writing ability, the Gallaudet Composition Examination, Inglis Vocabulary, Cooperative Reading Level of Comprehension and Speed of Comprehension. Little change or gain was shown on the specific aspects of English grammar measured in the essays written by the students, i.e., percentage of nouns used correctly, percentage of articles used correctly, and subject-verb agreement. The complexity of sentence measures (Table 26) also showed no significant change from the beginning to the end of the school year.

Table 26

Mean Complexity Scores* on Written Essays for Sub-Sample of Preparatory Students (Exp. N = 14, Control N = 12)

	Transform Rule Included		Used Correctly		Used Incorrectly	
	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
Fall	22.00	23.50	20.07	21.25	12.28	10.25
Spring	21.50	22.70	20.15	21.75	9.38	8.92
Diff.	-.5	-.80	.08	.50	-2.90	-1.33

* based on the form,"A Generative Grammar of the Sentences in a Small Closed Corpus" included in the Appendix.

Now to the most important part of the evaluation, the comparison between methods and the significance of the interaction of methods and levels of ability. Inspection of the F ratios for the comparison of methods revealed only one statistically significant difference: the Cooperative Reading Speed of Comprehension scores. Two interactions between level of ability and method were statistically significant: percentage of nouns and articles used correctly.

These results are, to put it mildly, disappointing. But further analysis of the data reveals that seven of the eight dependent variable means (excepting complexity) for the experimental group were higher than the comparable means for the control group. Since these are correlated measures no non-parametric analysis of these differences is possible. It does suggest, however, that the obtained differences may not be chance after all. This finding coupled with the very substantial revision of the materials led to another formal evaluation of the curriculum materials.

B. 2. Evaluation of the Overall Version of Curriculum Materials (Last Version 1967-68)

As stated above, it was decided to evaluate the last version of the curriculum materials after the 1967-68 academic year had already begun. It was only possible, therefore, to employ a simple pre- and post-treatment design in the hope of demonstrating a substantial gain on six of the nine dependent variables used the previous year.[3]

The mean differences in Table 27, however, did not meet expectations. In fact, the three aspects of grammatical correctness on the written essays showed slight declines. Perhaps the unusual spring essay topic, the riots in Washington, was not handled as well as more familiar topics. The global measures of English proficiency, on the other hand, reflected a small improvement over the year. All in all, relatively little desirable change took place.

C. Measures of English Fluency as Potential Predictors of English Performance

In the beginning of the 1965-66 academic year, the thirteen tests measuring the five different factors described above were administered to preparatory students. Zero order correlation coefficients with criterion measures administered at the close of the year were obtained. Eight of these tests failed to predict significantly better than zero. Four tests remained as possibilities for administration in the following year, 1966-67. These were Test 1 of the Semantic Spontaneous Flexibility factor group, Test 2 of the Expressional Fluency factor group, Test 2 of the Word Fluency factor group, and Test 1 of the Associational Fluency factor group.

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3 Three of the 1966-67 dependent variables were not used. The Inglis Vocabulary Test had been replaced as a selection instrument by the college. Hence, it was never administered to the students. The quality ratings were not rendered on the essays because it was not possible to disguise which essay was the fall or spring essay. To make matters worse for experimental pusposes, all of the students wrote about the spring riots in Washington, D. C. Raters knowing which was the later essay could not be relied on to control their bias. Finally, the amount of time required to obtain the complexity measure seemed excessive when changes in complexity could not be interpreted as necessarily favorable or unfavorable.

Table 27

Means and Standard Deviations of Six Measures of English Proficiency at the Open and Close of Academic Year 1967-68

	Global Measures of English Proficiency						Specific Aspects of Grammar on Written English					
	Gallaudet Entance Part 1 (N=164)		Coop. Read. Level of Comprehension (N=159)		Coop. Read Speed of Comprehension (N=163)		PERCENTAGE CORRECT Articles (N=174)		Nouns (N=174)		Subject-Verb (N=174)	
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
Fall	16.4	4.8	141.10	7.6	140.8	6.8	88.5	10.2	88.8	9.4	84.1	12.2
Spring	17.7	4.6	142.0	7.4	143.0	5.0	85.4	9.3	85.5	9.7	79.1	13.3
Diff.	1.3	3.5	.9	6.6	2.2	4.6	-3.1	11.4	-3.3	10.8	-5.0	14.4
r		.72		.60		.68		.32		.36		.36
t	4.88*		1.75		5.91*		4.09*		3.61*		4.63*	

* P < .01

Table 28

Multiple Correlations for Single and Double Test Addition to Basic Test Battery
(Gallaudet Composition Examination and Inglis Vocabulary Test)
Against Three Criteria of English Ability

Basic Battery	Fluency Variables	Rating of Essay Quality	Cooperative Reading Level	Cooperative Speed of Comprehension
Gall., Ing.		.63	.43	.44
Gall., Ing.	Xs	.64	.45	.45
Gall., Ing.	Fe	.64	.45	.51
Gall., Ing.	Fw	.63	.46	.46
Gall., Ing.	Fa	.63	.43	.44
Gall., Ing.	Xs, Fe	.64	.46	.52
Gall., Ing.	Fw, Fa	.63	.46	.46
Gall., Ing.	Xs, Fw	.64	.47	.48
Gall., Ing.	Xs, Fa	.64	.45	.45
Gall., Ing.	Fe, Fw	.64	.48	.53
Gall., Ing.	Fe, Fa	.64	.45	.51
Gall., Ing.	Xs, Fe, Fw, Fa	.64	.49	.53

Definition of Variables

Gall = Gallaudet Composition Examination

Ing = Inglis Vocab. Test

Xs = Semantic Spontaneous Flexibility

Fe = Expressional Fluency

Fw = Word Fluency

Fa = Associational Fluency

In the 1966-67 academic year multiple regression equations between most combinations of these four predictor variables and each of three criteria were obtained. The criteria were the ratings of essay quality, the Cooperative Reading Test Level of Comprehension and Speed of Comprehension. As stated earlier, a new test would have predictive value only if its use added to the predictive efficiency of the two test battery already in use, i.e., the Gallaudet Composition Examination and the Inglis Vocabulary. The mutiple R's between the Gallaudet Composition Examination, the Inglis Test, and all single and double combinations of the four other tests and the three criteria are presented in Table 28. Examination of Table 26 reveals no real increase in the ability to predict writing skill or reading level of ability over that already achieved by the two test battery. A modest gain in predicting speed of comprehension, from .44 to .51, may come when the Expressional Fluency is added to the initial two test battery. However, given the fact that this finding has not been cross validated, it is safest to regard this as a chance result.

CONCLUSIONS AND RECOMMENDATIONS

In spite of the hopes and judgments of project personnel, the experimental results are clear: Little or no change in English performance resulted from the use of the new English curriculum materials.

It is possible to postulate a wide variety of reasons for this fact. It may be too late in the lives of these students to effect substantial changes in their ability to write English. Perhaps not enough time is provided for instruction in English in the current preparatory program. Possibly the students do not do enough extra-curricular work in English. Maybe the materials were not intrinsically motivating. Suffice it to say that the operational program simply did not and does not afford a reasonable opportunity to ascertain which of the above explanations is correct. The necessary controls simply cannot be applied. The authors believe that the most promising next step is to assume that changes in the application of the materials and in the amount of practice will effect the desired improvement in the English language skills of the student.

APPENDIX

Name _____ Section _____

Student Achievement Record

Chapter One

	No. of Points	Pre-Test	Post-Test	Comments
I. Sentence vs. Non-sentence				
A. Identifying sentences and non-sentences	15			
B. Answering questions	10			
C. Transforming statements into questions	10			
D. Transforming positive statements into negative	10			
E. Separating subjects and predicates	15			
II. Agreement				
A. Choosing verb forms	10			
B. Filling in pronouns	10			
III. Present (non-past) Tense vs. Past Tense				
A. Transforming present tense into past tense	14			
B. Writing a paragraph (past tense)	6			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Two

	No. of Points	Pre-Test	Post-Test	Comments
I. Noun-Pronoun Equivalence				
A. Substituting nouns for pronouns	10			
B. Substituting pronouns for nouns	15			
C. Substituting pronouns for nouns (second reference)	15			
II. Noun Types				
Sorting nouns into count and non-count	15			
III. Articles				
Filling in articles in sentences	20			
IV. Article Equivalents				
A. Choosing much or many	5			
B. Choosing a little or a few	5			
C. Choosing another, other, the other, the others	10			
V. Singular and Plural Nouns				
Transforming plural nouns singular (sentences)	5			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Three

	No. of Points	Pre-Test	Post-Test	Comments
I. Sentence Patterns				
A. Sorting transitive and intransitive sentences	20			
Explaining the difference	5			
B. Filling in adverbs or nominal fields	20			
II. Noun-Pronoun Equivalence				
Substituting pronouns for nominal fields	20			
III. Adverbial Fields				
A. Combining two sentences into one with two adverbial complements	8			
B. Adding adverbs to sentences	7			
IV. Noun Objects				
Adding two objects to verbs	10			
V. Verbal Fields				
Writing the correct form of *have* plus a given verb	10			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Four

	No. of Points	Pre-Test	Post-Test	Comments
I. Matching Single Verbs and Idioms				
Substituting single verbs for idioms (verb-particle combinations)	10			
II. Matching Idioms and Objects				
Crossing out incorrect objects	10			
III. Single and Combination Verbs				
Underlining main verbs	20			
IV. Verbs and Particles				
A. Filling in particles	10			
B. Filling in verbs	10			
V. Negative Answers				
A. Writing short answers	10			
B. Writing full answers	10			
VI. Changing Statements to Questions				
A. Substituting pronouns for nouns	10			
B. Transforming statements into questions	10			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Five

	No. of Points	Pre-Test	Post-Test	Comments
I. Sentence Patterns				
Sorting transitive, intransitive and linking sentences	22			
Explaining the difference between linking sentences and the others	5			
II. Questions				
Transforming statements into questions	10			
III. Negative Statements				
Transforming positive statements into negative statements	10			
IV. Verbal Fields				
Filling in the proper verb forms	10			
V. Complements vs. Objects	10			
VI. The Verb 'Be'				
A. Filling in forms of be	13			
B. Filling in the present tense (v or vs) or the present progressive (b vg)	20			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Six

	No. of Points	Pre-Test	Post-Test	Comments
I. Sentence Patterns				
A. Sorting transitive, intransitive, linking, and describing sentences	25			
B. Explaining the difference between the describing pattern and the others	10			
II. Active and Passive Voice				
A. Transforming verbs from active to passive voice	10			
B. Transforming verbs from passive to active voice	10			
III. Verb Forms: vg and vx				
Choosing the vg or vx form	15			
IV. Parallelism				
Choosing adverb or adjective forms	10			
V. Adjectives and Adverbs				
Filling in adjective and adverb forms and identifying them	20			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Seven

	No. of Points	Pre-Test	Post-Test	Comments
I. Compound Subjects: Agreement				
Choosing v or vs forms	10			
II. Compound Sentences				
Combining two sentences with and, but, or or	20			
III. Compound Sentences and Sentence Parts				
Combining two sentences, omitting unnecessary elements	15			
IV. Parallelism				
Crossing out incorrect parts and substituting correct ones	10			
V. And/Semicolon				
Choosing and or a semicolon to compound two sentences	10			
VI. Conjunctive Adverbs				
Choosing correct connectives	15			
VII. Compound Sentences in a Paragraph				
A. Improving a paragraph by compounding some sentences	10			
B. Improving a paragraph by compounding some sentences	10			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Eight

	No. of Points	Pre-Test	Post-Test	Comments
I. Complete vs. Incomplete Sentences				
Identifying complete and incomplete sentences	10			
II. Words that Introduce Adjective Clauses				
Filling in introductory words	10			
III. Complex Sentences with Adjective Clauses				
A. Transforming sentences into adjective clauses	20			
B. Adding adjective clauses to matrix sentences	10			
C. Adding matrix sentences to adjective clauses	5			
IV. Adjective Phrases and Clauses				
A. Identifying phrases and clauses by underlining	10			
B. Reducing clauses to phrases or words	10			
C. Expanding phrases into clauses	10			
V. Adjective Clauses in a Paragraph				
Combining pairs of sentences by transforming one of each pair into an adjective clause	15			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Nine

	No. of Points	Pre-Test	Post-Test	Comments
I. Complete vs. Incomplete Sentences				
Identifying complete and incomplete sentences	10			
II. Words that Introduce Adverbial Clauses				
Filling in adverbial conjunctions	10			
III. Complex Sentences with Adverbial Clauses				
A. Transforming sentences into adverbial clauses	10			
B. Adding adverbial clauses to matrix sentences	10			
C. Adding matrix sentences to adverbial clauses	10			
IV. Adverbial Phrases and Clauses				
A. Identifying phrases and clauses by underlining	10			
B. Reducing clauses to phrases or words	10			
C. Expanding phrases into clauses	10			
V. Adverbial Clauses in a Paragraph				
Combining pairs of sentences by transforming one of each pair into an adverbial clause	20			
TOTAL:	100			

Name _____ Section _____

Student Achievement Record

Chapter Ten

	No. of Points	Pre-Test	Post-Test	Comments
I. Complete vs. Incomplete Sentences				
Identifying complete and incomplete sentences	10			
II. Words that Introduce Noun Clauses				
Filling in relative words	10			
III. Complex Sentences with Nominal Clauses				
A. Transforming sentences into nominal clauses	10			
B. Adding nominal clauses to matrix sentences	10			
C. Adding matrix sentences to nominal clauses	10			
IV. Nominal Phrases and Clauses				
A. Identifying phrases and clauses by underlining	10			
B. Reducing clauses to nominal fields that are not clauses	10			
C. Expanding phrases into clauses	10			
V. Nominal Clauses in a Paragraph				
Combining pairs of sentences by transforming one of each pair into a nominal clause	20			
TOTAL:	100			

A Generative Grammar
of the Sentences in a Small Closed Corpus

			Yes a	No b		Rule in use c	Rule Misused d	
1.0	Sentences conjoined	?	☐	☐	0.01	☐	☐	conj
.1	Trans clause struct	?	☐	☐	.02	☐	☐	v.t.
.2	Intransitive struct	?	☐	☐	.03	☐	☐	v.i.
.3	Linking--Nominal	?	☐	☐	.04	☐	☐	be
.4	Descr.--Adjectival	?	☐	☐	.05	☐	☐	S → ☐ △
.5	One-word sentence	?	☐	☐	.06	☐	☐	interj
2.0	Opening Adverbial	?	☐	☐	.07	☐	☐	adv
.1	adv, or adv-headed	?	☐	☐				
.2	Prepositional phrase	?	☐	☐	.08	☐	☐	prep
.3	N-field used as adv	?	☐	☐				
.4	Subordinate clause	?	☐	☐	.09	☐	☐	subor
.5	Sentence transform	?	☐	☐				
.6	More than 1 Adv'ial	?	☐	☐				
3.0	Pronoun as subject	?	☐	☐	.10	☐	☐	pn
4.0	Pronoun as object	?	☐	☐	.11	☐	☐	pn
					.12	☐	☐	the
5.0	Exp of Det + n + N°	?	☐	☐	.13	☐	☐	a/an
.1	adj, or adj-headed	?	☐	☐	.14	☐	☐	∅
.2	Prepositional phrase	?	☐	☐	.15	☐	☐	N°
.3	Adjectival clause	?	☐	☐	.16	☐	☐	noun
.4	Appos, or conj-N	?	☐	☐	.17	☐	☐	n'
.5	Adnominal S-transf'm	?	☐	☐	.18	☐	☐	adj
.6	N-clause or transf'm	?	☐	☐				
6.0	Predicates conjoined	?	☐	☐	.19	☐	☐	v
.1	Doubly complemented	?	☐	☐	.20	☐	☐	vs
					.21	☐	☐	vd
7.0	V -field structure:		☐	☐	.22	☐	☐	m
					.23	☐	☐	h
					.24	☐	☐	b
8.0	vg-complement trans	?	☐	☐	.25	☐	☐	vg
.1	vx-complement trans	?	☐	☐	.26	☐	☐	vx
.2	to-v-complement tr	?	☐	☐				
9.0	There or It trans	?	☐	☐				
.1	Permutation trans	?	☐	☐				
.2	Deletion transform	?	☐	☐				
.3	Series trans rule	?	☐	☐				
.4	Other transforms	?	☐	☐				
			a	b		c	d	

Sample: Checker: Date: